Neuropeptides from the cHH (crustacean Hyperglycemic Hormone) family in Arthropods.

Daniel Soyez, Laboratoire de Biochimie, ER100CNRS, Ecole Normale Supérieure, 46 rue d'Ulm, Paris.

In crustaceans, important physiological functions such as homeostasis, growth and reproduction are regulated by neurohormones elaborated primarly in a major neuroendocrine center: the X-organ-sinus gland complex. These neuropeptides have been recently shown to be structurally related, thus defining a new peptide family designated as the crustacean Hyperglycemic Hormone (cHH) family, cHH being the first described and the major neurohormone elaborated by the X-organ-sinus gland complex.

cHHs are 72 aa residue peptides with 6 cysteine residues in conserved positions. In addition, the primary structure of the cHHs is highly conserved among the different species with a percentage of homology above 60%. Other members of the cHH family, fully characterized in a very few species only, are 77-78 aa residue inhibitory neuropeptides involved in the regulation of molting (Molt-Inhibiting Hormone, MIH) and reproduction (Gonad Inhibiting Hormone, GIH also called Vitellogenesis Inhibiting Hormone, VIH). It was recently demonstrated that crustacean mandibular organs (equivalents of insect corpora allata) are negatively regulated by a neurohormone (Mandibular Organ Inhibiting Hormone, MOIH) closely related to MIH and VIH.

Peptides belonging to the cHH family are generally polymorphic. This polymorphism results from changes in the aminoacid sequence and also, as recently demonstrated, to an isomerisation of one amino acid residue (Phe^3 in lobster or crayfish cHHs) from the L- to the D-configuration (conformational polymorphism). This isomerization occurs in specialized neurosecretory cells only and constitutes a new mode of post-translational modification. Such structural changes are correlated with modifications in the biological activities of the neuropeptides: in addition to their hyperglycemic effect which is evoked with a retarded kinetics, cHH isoforms containing D-aminoacid have been demonstrated in different species to possess MIH or osmoregulatory bioactivity.
The presence of cHH-related peptides have been described in different arthropod groups: from the venom of the black widow spider *Latrodectus mactans*, a peptide structurally related to cHH has been purified and sequenced. However, no biological activities could be attributed to this peptide. Using specific antisera developped against lobster cHH, the presence of cHH-like molecules has been demonstrated by immunohistochemistry in neurohemal organs of the centiped *Lithobius forficatus* and the scorpion *Euscorpius carpathicus*. In the locust *Schistocerca gregaria* ion and fluid transport in the ileum are regulated by a neuropeptide originating from the corpora cardiaca. The aminoacid sequence of the first 34 residues shows 59% homology with lobster cHH.

Finally, it may be hypothesized that peptides belonging to the cHH family are in fact widely spread among arthropods and may play important, although still unknown, physiological roles.

Source: https://www.industrydocuments.ucsf.edu/docs/fpcb0000